

Chapter 1

Welcome and Introduction

- Introduction to Volunteer Water Quality Monitoring Training Notebook -

I. Volunteer Water Quality Monitoring Program

This program is a partnership between the Missouri Departments of Conservation (MDC) and Natural Resources (DNR), the Conservation Federation of Missouri (CFM), and the citizens of Missouri.

- **MDC** is responsible for managing Missouri's forest, fish and wildlife resources and is concerned about water pollution impacting these resources.
- **DNR** is the regulatory agency in Missouri and has authority over water, air, solid waste, environmental hazardous waste, and mining. DNR also has responsibility for parks, energy, geology, land survey, etc.
- **CFM** is an organization for citizens concerned about Missouri's natural resources and environmental issues. CFM is the Missouri affiliate of the National Wildlife Federation.
- **CITIZENS.** We need your help. We need your eyes, ears, hands, and minds to help care for Missouri's streams.

Goals of the Volunteer Water Quality Monitoring Program

- Inform and educate citizens about the conditions of our streams
- Establish a monitoring network
- Enable citizens to make informed decisions
- Halt the degradation of our streams

II. The Volunteer Water Quality Monitoring Program is open to anyone who is interested in water quality. The only requirements are a sincere interest, concern for streams, and a willingness to contribute time for monitoring.

- There are no fees.
- There are different levels of involvement and commitment that build upon each other. This flexible program allows you, the volunteer, to choose your own level of participation in monitoring activities.

III. Monitoring Levels

Introductory

This is the entry level of monitoring that includes watershed mapping, site selection, stream discharge, and biological monitoring. The primary emphasis is education about watersheds. These classes are usually offered in the spring and early summer of each year.

Level 1

Volunteers are eligible to attend a Level 1 workshop once they have completed the Introductory workshop (meaning attended the entire class) and submitted Site Information data, Stream Discharge, and Macroinvertebrate data at least once.

Level 1 training reviews biological monitoring and teaches the volunteer how to conduct both chemical and physical monitoring. This is the workshop in which the volunteer is qualified to receive chemical monitoring equipment. A quality control designation of Level 1 indicates that the volunteer has completed the 8-hour Level 1 workshop. Level 1 classes are offered in the late summer and early fall of each year.

Level 2

Volunteers are eligible to attend a Level 2 workshop once they have completed the Level 1 workshop (meaning they attended the entire class) and have submitted all four types of data: Visual Survey, Macroinvertebrate, Stream Discharge, and Water Chemistry data at least twice.

Attending a Level 2 workshop allows volunteers to do these things:

- Check chemical monitoring equipment to ensure its proper function
- Improve chemical monitoring techniques
- Improve the ability to correctly identify macroinvertebrates. Assistance will be available to identify unknown invertebrates from streams and confirm identification of invertebrates in reference collections.

Level 2 data is assigned the quality control designation, and indicates that a volunteer has successfully completed the Level 2 Quality Assurance/Quality Control Workshop. Level 2 workshops are usually offered during the winter of each year.

Due to the elevated confidence in data provided by Level 2 volunteers, we want to ensure we are providing the highest quality data to the sponsoring agencies and all other data users. **To reach this goal and to increase confidence in the data, the Program is now requiring individuals to have their equipment checked at least once every three years in order to continue to maintain quality assurance and confidence in data collected by Level 2 and 3 volunteers.**

Volunteers can either attend one of the regularly scheduled Level 2 trainings or a Level 2 Validation Training. The Validation Training is a shorter 2½ hour session held during the evening. This training is critical to ensure that the volunteer's equipment is functioning properly, and all trained monitors are up to speed with any changes that may be occurring in the program.

Level 3

A volunteer must have successfully completed the Level 2 workshop before being eligible for Level 3. Volunteers who regularly submit all four data sets may be the most comfortable taking the Level 3 evaluation.

The designation of Level 3 indicates that program personnel have successfully evaluated the volunteer in the field at their monitoring site. This evaluation is scheduled by appointment only. *It is recommended that the volunteer request evaluation during a time*

of year they regularly sample macroinvertebrates. By doing so, the volunteer ensures the highest level of familiarity and confidence identifying the types and seasonal sizes of invertebrates in their stream.

For more information on the Stream Team Program, visit our website:

<http://www.mostreamteam.org>.

IV. Today's Workshop Goals

- Provide introductory information and training about watersheds and stream discharge
- Qualify the student for equipment to conduct biological monitoring
- Assist with site selection
- Facilitate networking of volunteers

V. What is expected from the volunteers?

- Share knowledge and information gained from this workshop and from monitoring efforts with others
- Periodically monitor a stream
- Submit data collected in a timely manner. Volunteers can attend a Level 1 workshop once they have submitted biological data, stream discharge data, and site information.

VI. Uses of Volunteer Data

In General

- Inform and educate people about the condition of our streams
- Establish baseline information due to its scarce or non-existent nature on many streams
- Locate emerging problems
- Identify long-term trends on stream conditions
- Supplement agency-collected data

Level 2 and 3 Data:

- Evaluate best management land use practices (BMPs)

- Aid in planning by local agencies, i.e. for zoning regulations
- Aid in planning and permitting within DNR
- Supplement Missouri DNR's Biennial 305(b) Report to EPA on the condition of the state's waters, commonly called the *Missouri Water Quality Report*

VII. The Volunteer Water Quality Monitoring Program takes a holistic approach to monitoring.

- A stream is a reflection of its watershed. This program places emphasis on looking at the entire watershed.
- The water quality of a stream is a combination of its physical, chemical, and biological characteristics.

VIII. Wadeable Streams Assessment/National Rivers and Streams Assessment

The *Wadeable Stream Assessment* was the first-ever nationwide survey of the biological condition of small streams. The assessment was conducted in 2004 by the EPA to determine the health of 1st-5th order streams using macroinvertebrate assemblages as indicators of water quality. After assessing more than half a million stream miles throughout the country, they found that:

- 42% of the nation's streams are in poor biological condition
- 25% are in fair biological condition, and
- 28% are in good biological condition.

Missouri is split between two major regions, both of which show a high percentage of streams in poor biological condition. When broken down into regions, it was determined that streams in the Western portion of the United States had the highest percentage in good biological condition at 45.1%. However, 5% of the nation's streams were not assessed, comprised primarily of 1st order New England streams.

For more information on the wadeable stream assessment go to <http://www.epa.gov> and search for *Wadeable Stream Assessment*.

Starting in 2011, EPA began the *National Rivers and Streams Assessment*. This time the survey will be conducted by federal, state, tribal, and other partners. The new assessment will be the second nationwide assessment on small streams. However, this new survey will include all streams and rivers in the United States. These include Great Rivers (Mississippi, Missouri, Colorado, etc.), wadeable and non-wadeable rivers and streams, and run-of-the-river ponds and pools.

For more information on the national stream assessment go to <http://www.epa.gov> and search for *National Stream Assessment*.

IX. Water Quality Standards

Laws and regulations support the need for a Volunteer Water Quality Monitoring program. You are collecting baseline data needed to determine if water quality for a segment of water is being protected adequately, is becoming threatened, or is now impaired. Take the opportunity to become familiar with these laws and regulations as they become available. Laws and regulations can be daunting, but they can also be interesting and educational once one becomes more familiar with them. If you ever have questions pertaining to a law or regulation, just ask!

Water Quality Standards (WQS) is the state regulatory program under the Clean Water Act (CWA). The main purpose of the WQS program is to protect public health and welfare by protecting water quality. This is reflected in the goals of the CWA, section 101(a); to “restore and maintain the chemical, physical, and biological integrity of the Nation’s waters”. These goals are accomplished by protecting existing water quality or assigning water quality goals, through designated uses and criteria. Each designated use reflects the existing water quality or goal of water quality to be protected, while the criteria are assigned to protect individual designated uses.

Water Quality Standards are supported by National Pollution Discharge Elimination System (NPDES) permitting. Designated use of the water segment, criteria to support that use, and general criteria including anti-degradation policies are the infrastructure for the

standards and are included in every NPDES permit. Water Quality Standards for designated uses of all classified water bodies in Missouri set maximum allowable concentrations for 110 chemicals, as well as other parameters such as dissolved oxygen and temperature.

To assign different levels of protection, Missouri divides waters into two categories; classified and unclassified waters. Classified waters maintain water during low flow periods in dry weather and are protected by numeric criteria, limiting the amount of pollutants allowed in the water. Unclassified waters are the remaining waters of the state and are protected for aesthetics by narrative criteria (or “free-from” statements). As of 2012, all perennial rivers and streams; all intermittent streams with permanent pools; and all rivers and streams spatially represented by the 1:100,000 scale of the National Hydrography Dataset (NHD) will now be classified. The miles of classified streams will increase by about 85,000 miles! These waters are also now protected for warm-water fisheries, whole body contact recreation, secondary contact recreation, human health protection, irrigation, and livestock and wildlife watering. This is a great advancement towards meeting the section 101(a) of the Clean Water Act.

Missouri’s designated uses include:

- Livestock and Wildlife watering (LWW)
- Drinking Water Supply (DWS)
- Whole Body Contact Recreation (WBC)
- Secondary Contact Recreation (SCR)
- Human Health Protection (fish and water consumption) (HHP)
- Irrigation (IRR)
- Protection of aquatic life
 - a. Warm-water Fishery (bluegill, etc.) (AQL)
 - b. Cool-water Fisheries (rock bass, etc.) (CLF)
 - c. Cold-water Fisheries (trout, hellbender, etc.) (CDF)
- Outstanding Resource Waters
 - a. National (ONRW)
 - b. State (OSRW)

Waters designated as drinking water supplies are protected for finished water quality in order to keep the cost of treatment down and give the highest protection of human health. The Safe Drinking Water Act (SDWA) protects human health and its criteria are included in WQS. The SDWA has goals of zero for all drinking water pollutants but also has maximum containment levels. Waters protected for recreation such as swimming, water skiing and fishing, also have a maximum allowable bacteria standard.

Section 303(c) of the Clean Water Act requires states to review these standards at least once each three-year period for the purpose of reviewing applicable Water Quality Standards and/or adopting new standards. At least one public hearing must be held on proposed changes. Known as the Triennial Review, it involves stakeholders, staff and the Clean Water Commission (a board assigned by the governor). Citizens are encouraged to be involved in the triennial review in order to protect water quality according to all interests. For more information on this process or the status of the triennial review, check out DNR's website: <http://dnr.mo.gov/env/wpp/rules/wpp-rule-dev.htm>

Whenever water quality is not protective of the designated use for a water body, that water body is designated as water quality limited, or impaired. Missouri's impaired waters are listed in compliance with section 303(d) requirements under the Clean Water Act. The 303(d) List helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs. It is crucial to note that often only a segment of a stream is listed on the 303(d) List. When a segment is listed, that does not mean that water quality is impaired for the entire stream, but only within the designated segment. Special emphasis is then given to restoring the water quality in the 303(d) listed portion of the stream.

For more information about WQS check out these sources:

- The Department of Natural Resources website;
<http://dnr.mo.gov/env/wpp/rules/wpp-rule-dev.htm>
- Official rule language in the Code of State Regulations, 10 CSR 20-7.031
- The Code of State Regulations on Secretary of State's website; www.sos.mo.gov.

- Official language of the Clean Water Act on EPA's website;
<http://www.epa.gov/lawsregs/laws/cwa.html>.
- EPA's federal regulations for implementing WQS contained in the Code of Federal Regulations, 40 CFR 131.

X. Leading Sources of Water Quality Impairment in Missouri Rivers

- Unknown
- Agriculture
- Atmospheric deposition
- Mining
- Hydro/habitat modification
- Municipal and other domestic point sources
- Urban runoff and construction
- Industrial point sources
- Land disposal facilities (landfills, etc.)
- Natural sources
- Recreational activities

(Source: Ranked according to available data from Missouri DNR's *Missouri Water Quality Report*, 2010)

Temperature

One factor that has an enormous effect on water quality is temperature. The rates of all biological and chemical processes depend on temperature. Aquatic organisms from benthic macroinvertebrates to fish are dependent on certain temperature ranges for their optimal health. If temperature falls outside this optimal range for a prolonged period of time, organisms become stressed and can die. Contaminants in the water also become more toxic at higher temperatures.

Temperature affects the oxygen content of the water (as water temperature increases, its ability to hold oxygen decreases), the rate of photosynthesis by aquatic plants, the

metabolic rates of aquatic organisms, and the sensitivity of organisms to toxic wastes, parasites, and diseases.

Causes of temperature change include:

- Weather
- The removal of riparian vegetation
- Impoundments (a body of water confined by a barrier like a dam)
- Discharge of cooling water
- Urban storm water
- Groundwater inflows to the stream

Temperature in a stream can vary with width and depth. Water temperature can be significantly cooler in shaded portions on a sunny day compared to unshaded portions. In a small stream, the temperature will be relatively constant as long as the stream is uniformly in sun or shade. In a large stream, temperature will vary considerably with width and depth, regardless of shade. Therefore, temperature should be measured at the same place every time.